Revue suisse de Zoologie 115 (3): 541-551; septembre 2008

Ophiotaenia gilberti sp. n. (Eucestoda: Proteocephalidea), a parasite of *Thamnodynastes pallidus* (Serpentes: Colubridae) from Paraguay

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Ophiotaenia gilberti sp. n. (Eucestoda: Proteocephalidea), a parasite of _Thamnodynastes pallidus_ (Serpentes: Colubridae) from Paraguay. - *Ophiotaenia gilberti* sp. n. is described from the intestine of the colubrid snake, *Thamnodynastes pallidus* (Linnaeus, 1758) (Serpentes: Xenodontinae), from Paraguay. The new species differs from most species of New World members of *Ophiotaenia* in possessing an apical organ. It differs from the six species possessing an apical organ by a smaller scolex diameter (140-145 versus more than 480) and by a smaller number of testes (57-91 versus more than 107). In all *Ophiotaenia* with two separate testes fields parasites of New World snakes, the ovary is small, occupying a surface five times smaller (in relation to the proglottis surface) than in most *Proteocephalus* parasites of Palaearctic fishes. This new character may become important in Proteocephalidea systematics. Because of the presence of two separate testicular field, preformed uterus and smaller ovary surface/proglottis surface ratio, we transfer the following *Proteocephalus* species parasite of snakes to *Ophiotaenia*: *Proteocephalus arandasi* Santos & Rolas, 1973 becomes *Ophiotaenia arandasi* new combination; *P. azevedoi* de Chambrier & Vaucher, 1992 becomes *O. azevedoi* new combination; *P catzeflisi* de Chambrier & Vaucher, 1992 becomes *O. catzeflisi* new combination; *P. euzeti* de Chambrier & Vaucher, 1992 becomes *O. euzeti* new combination; *P. joanae* de Chambrier & Paulino, 1997 becomes *O. joanae* new combination; *P. micruricola* Shoop & Corkum, 1982 becomes *O. micruricola* new combination and *P. variabilis* Brooks, 1978 becomes *O. variabilis* new combination.

Keywords: Cestoda - Proteocephalidae - taxonomy - morphology - snakes - Paraguay.

INTRODUCTION

Two snakes *Thamnodynastes pallidus* (Linnaeus, 1758) (Colubridae, Xenodontinae) collected in Paraguay in 1982 and 1987 harboured proteocephalidean cestodes of the genus *Ophiotaenia* La Rue, 1911. Since these worms cannot be accommodated in any hitherto known species of the genus, they are described as new taxon.

Manuscript accepted 01.05.2008

MATERIALS AND METHODS

Ten specimens of *Thamnodynastes pallidus* (Linnaeus, 1758) were examined. They were killed by injection of MS 222 solution (Methanesulfonate salt, Sigma, No A-5040) and immediately dissected. The digestive tract was fixed with hot 4% neutral formalin and subsequently stored in 75% ethanol. The worms were stained with Mayer's hydrochloric carmine, dehydrated in an ethanol series, cleared with eugenol (clove oil), and mounted as permanent preparations in Canada balsam. For histology, pieces of strobila were embedded in paraffin, transversely sectioned at 12-15 μm intervals, stained with Weigert's hematoxylin, and counterstained with 1% eosin B (see de Chambrier, 2001). Eggs were studied in distilled water. No specimens were available for SEM studies. Material has been deposited in the helminthological collection of the Natural History Museum, Geneva, Switzerland (INVE). All measurements are given in micrometers unless otherwise indicated. Abbreviations used in descriptions are as follows: x = mean; n = number of measurements; CV = coefficient of variation, tn = testes number; sd = scolex diameter.

RESULTS

Ophiotaenia gilberti sp. n. Figs 1-7

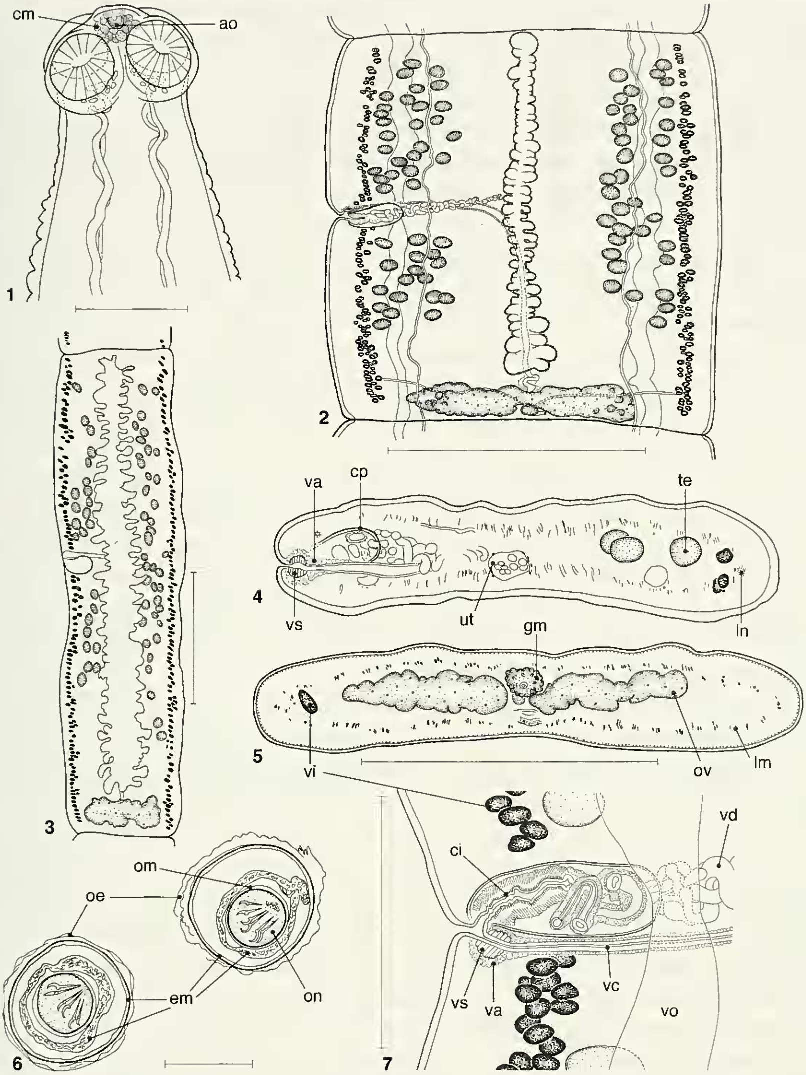
TYPE MATERIAL: Holotype MHNG INVE 18242 (1 slide), Estancia General Diaz, Alto Paraguay, 26.11.1987 and 2 paratypes MHNG INVE 54914 (1 slide) and 54915 (1 slide whole mount specimen and 8 slides serial sections), all with field number Py 5288.

OTHER MATERIAL: MHNG INVE 18193, San Benito Pastoreo, Itapua, Paraguay, 30.10. 1982, 1 specimen without scolex, 3 slides, field number Py 2723.

DESCRIPTION (based on 4 specimens): Proteocephalidae, Proteocephalinae. Large-sized worms, 60-170 mm long, up to 1.5 mm wide, flattened dorsoventrally, with last proglottides very elongated, and almost spherical in transverse section. Strobila acraspedote, anapolytic. About 173-182 immature proglottides (up to appearance of spermatozoa in vas deferens), about 5-7 mature proglottides (up to appearance of eggs in uterus), about 15-16 pregravid proglottides (up to appearance of hooks in oncospheres), about 193-205 proglottides in total. Unsegmented zone posterior to scolex very long. Immature and mature proglottides wider than long to longer than wide; pregravid and gravid proglottides longer than wide. Last proglottides much longer than wide (Fig. 3), length: width ratio being up to 3.7: 1. Tegument 10 thick.

Scolex spherical, aspinose, 140-145 in diameter and 95-100 long (Fig. 1), with four small uniloculate suckers, 65-75 in diameter. Small glandular apical organ present, about 15 in diameter, composed of small cells, probably of exocrine type, with lumen and canal opening on apical surface, surrounded with small cells of finely granular cytoplasm (Fig. 1). The apical organ diameter represents about 10% of scolex diameter.

Internal longitudinal musculature developed (Figs 4, 5), forming anastomosed fine bundles of muscular fibres. Osmoregulatory canals overlapping testes (Fig. 2). Ventral canals, 45-65 in diameter (Figs 2, 7) situated at 16-22% of the proglottis width from the lateral margin, with a tendency to separating longitudinally the testicular field. Dorsal canals situated at 19-27% of the proglottis width, 2.5-5 in diameter, more medially than the ventral one.



FIGS 1-7

Ophiotaenia gilberti sp. n. (1) Scolex, holotype No. MHNG INVE 18242. (2) Mature proglottis, holotype: No. MHNG INVE 18242, dorsal view. (3) Gravid proglottis, paratype No. MHNG INVE 54914: ventral view. (4) Transverse section of median part of segment, pregravid proglottis, paratype No. MHNG INVE 54915. (5) Transverse section of posterior part of pregravid proglottis, paratype No. MHNG INVE 54915. (6) Eggs (from the paratype No. MHNG INVE 54915) drawn in distilled water. (7) Cirrus pouch and vagina, holotype No. MHNG INVE 18242, ventral view. Abbreviations: ao = apical organ; cm = glandular cells; ci = cirrus; cp = cirrus sac; do = dorsal osmoregulatory canal; em = embryophore; gm = Mehlis' glands; lm = internal longitudinal musculature; ln = longitudinal lateral nerves; oe = outer envelope; om = oncospheric membrane; on = oncosphere; ov = ovary; te = testes; ut = uterus; va = vagina; vc = vaginal canal; vd = vas deferens; vi = vitelline follicles; vo = ventral osmoregulatory canal; vs = vaginal sphincter. Scale bars: 1= 100 μm; 2, 3 = 1000 μm; 4, 5 = 500 μm; 6 = 20 μm; 7 = 250 μm.

Testes medullary, spherical to oval, in one layer, in two distinct lateral fields (Figs 2, 3). Testes numbering 57-91 (x = 72, n = 19, CV = 14), situated on the two-thirds to three-quarter anterior of the proglottis, never reaching anterior margin of ovary. Testes 50-95 in diameter, degenerated in gravid proglottides. Vas deferens coiled, elongated, very thin, not reaching to midline of proglottis, never crossing it (Fig. 2). Cirrus sac elongate, thin-walled, 220-265 long, representing 15-23% (x = 19%, n = 21, CV = 9%) of proglottis width. Cirrus occupying up to 55% of cirrus sac length (Fig. 7).

Genital ducts passing between osmoregulatory canals. Genital atrium present. Genital pores irregularly alternating, situated in 42-50% (x= 46%, n = 22, CV = 4%) of proglottis length.

Vagina posterior (37%) or anterior (63%, n = 23) to cirrus pouch, its proximal part lined with some intensely staining cells. Muscular terminal sphincter present, 35 in diameter (Figs 4, 7). Mehlis' glands 80-115 in diameter, representing 6-10% of proglottis width (Fig. 5).

Ovary medullary, bilobed, small, 555-795 wide, occupying 56-69% (x = 63%, n = 22, CV = 6%) of proglottis width (Figs 2, 3, 5) and 3.7% of the proglottis surface.

Vitelline follicles medullary, oval, very small (13-20 wide by 20-32 long), arranged in two lateral rows, interrupted porally by vagina and cirrus pouch, not reaching anterior and posterior margins of segments, occupying porally 85-96 % and aporally 90-94 % of proglottis length, respectively. A few follicles penetrating the cortex (Figs 2-4).

Anlage of uterus medullary, already present in immature proglottides. Uterus with 28-41 (n = 14) medullary, latero-dorsal branches on each side (Figs 2, 3).

Formation of uterus of type 1 according to de Chambrier *et al.* (2004): in last immature proglottides and first mature proglottides, uterine stem with tubular concentration of numerous intensely staining cells and with lumen. In mature proglottides, thin-walled lateral diverticula growing (Fig. 3). Distal part of diverticula composed of some intensely staining cells. At this stage, uterus occupying about 5% of proglottis width. In pregravid proglottides, eggs completely filling uterine stem and diverticula, occupying about 13% of proglottis width. In gravid proglottides, thin-walled digitate diverticula growing laterally, occupying up to 48% of proglottis width. Uterus with some longitudinal apertures in gravid proglottides.

Early appearance of embryonic hooks in oncospheres (about 15-16 proglottides after appearance of eggs in uterus). Eggs spherical, with thin, hyaline collapsed outer envelope; inner envelope consisting of two-layered embryophore, with external thick layer, 27-28 in diameter and nucleate irregular envelope, 19-23 in diameter; oncospheres 12-15 in diameter, with 3 pairs of embryonic hooks 10-11 long (Fig. 6).

TYPE LOCALITY: Estancia General Diaz, Alto Paraguay, Paraguay, 21° 09'S 57° 32'W.

TYPE HOST: *Thamnodynastes pallidus* (Linnaeus, 1758) (Colubridae, Xenodontinae), MHNG 2434.017.

SITE OF INFECTION: anterior part of intestine.

PREVALENCE: 2/10 (20%).

INTENSITY: 1-3 specimens.

ETYMOLOGY: The new species is named in honour of Gilbert Ammann, father of the first author.

DIFFERENTIAL DIAGNOSIS: The present species is placed in the genus *Ophiotaenia* La Rue, 1911 (Proteocephalinae), because of the medullary position of vitellaria, unarmed scolex, shape of uniloculate suckers, and testes forming two separate fields (Schmidt 1986). Up to now, 89 *Ophiotaenia* species has been described (Freze, 1965b; Schmidt 1986; Scholz & de Chambrier, 2003), most of them are considered to be valid (Schmidt 1986). In the New World, 26 *Ophiotaenia* species are known to parasitize snakes (Rudolphi, 1819; Leidy, 1885; Barrois, 1898; Parona, 1901; La Rue, 1911; Rudin, 1917; MacCallum, 1921; Fuhrmann, 1927; Harwood, 1933; Vigueras, 1934; Lopez-Neyra & Diaz-Ungria, 1958; Dos Santos & Tayt-Son Rolas, 1973; Freze & Ryšavy, 1976; Brooks, 1978; Shoop & Corkum, 1982; de Chambrier, 1990; de Chambrier *et al.*, 1991, 1992; de Chambrier & Paulino, 1997).

Ophiotaenia gilberti n. sp. differs from 20 out of those 26 species (see Table 2) in the possession of an apical organ. The present material differs from the remaining six species by a much smaller scolex (sd =140-145), and by a lower number of testes (tn = 57-91). Those following six species have distinct measurements for the two characters cited above: *O. faranciae* Mac Callum, 1921 (sd = 500, tn = 390-420); *O. grandis* (La Rue, 1911) Harwood, 1933 (sd = 1000-1200, tn = 200-250); *O. marenzelleri* (Barrois, 1898) Railliet, 1899 (sd = 1200-2000, tn = 230-240); *O. jarara* (Fuhrmann, 1927) (sd = 1220, tn = 150-187); *O. catzeflisi* (de Chambrier, Vaucher et Renaud, 1992) (sd = 990-1220, tn = 107-158) and *O. joanae* (de Chambrier & Paulino, 1997) (sd = 480-790, tn = 147-210). Furthermore, neither *O. faranciae*, *O. grandis* nor *O. marenzelleri* possess a vaginal sphincter.

DISCUSSION

The prevalence of the Proteocephalidea in amphibians in the Neotropical region is usually very low (see de Chambrier *et al.*, 2006). Furthermore, when comparing the number of amphibians species infected with Proteocephalidean cestodes with the total number of species examined, we observed that only 5 hosts species out of 91 were infected (5.5%) in Ecuador, 5 out of 64 (7.8%) in Paraguay, 1 out of 47 (2%) in Costa Rica (de Chambrier *et al.*, 2006). In reptiles from Central and South American, the percentage of infected taxa is considerably higher (Table 1); 9 out of 36 (23%) snake species examined between 1988 and 1992 in Brazil by A. de Chambrier, were infected with proteocephalidean cestodes, 14 out of 57 (24.5%) between 1984 and 1990 in Ecuador by J.-M. Touzet, 8 out of 44 (18%) between 1979 and 1993 in Paraguay by members of the Geneva Natural History Museum, 12 out of 44 (27%) between 2001 and 2005 in Costa Rica by D.R. Brooks and collaborators. It is interesting to point out that the global percentage of species infected with Proteocephalidea in Neotropical amphibian hosts is of 2 to 7.8% and in Neotropical reptiles of 18 to 27% and is at reverse of what we may expect: even if no *Ophiotaenia* life-cycles have been described from the Neotropical region, the known life-cycles of Proteocephalidea are closely linked with water, with a large majority of life-cycles using planktonic copepods as

TABLE 1. Proteocephalidean tapeworms collected from reptilian hosts in South America and Central America countries between 1979 and 2005.
* New hosts for proteocephalidean cestodes

Country/parasite species	Total member of hosts species examined / Host species	No. hosts examined	No. hosts infected	Prevalence (%)	Hosts species infected with Proteocephalidean /total number of hosts species examined
Ecuador	**57 species**	**294**	**27**	**9.2%**	**14/57 (24.5%)**
Ophiotaenia sp.	*Bothrops atrox**	4	2	50	
Ophiotaenia sp.	*Bothrops atrox**	4	2	50	
Ophiotaenia sp. *immature*	*Bothrops pulcher**	1	1	100	
Ophiotaenia sp.	*Clelia clelia**	2	1	50	
Ophiotaenia sp.	*Dendrophidion dendrophis**	3	1	33.3	
Ophiotaenia sp.	*Drymoluber dichrous**	3	2	66.6	
Ophiotaenia sp.	*Drymobius rhombifer**	1	1	100	
Ophiotaenia sp.	*Imantodes cenchoa**	77	5	6.5	
Ophiotaenia sp.	*Liophis epinephelus**	2	2	100	
Ophiotaenia sp.	*Oxyrhopus formosus**	1	1	100	
Ophiotaenia sp.	*Oxyrhopus petola**	9	5	55.5	
Ophiotaenia sp.	*Pseudoboa coronata**	1	1	100	
Ophiotaenia sp.	*Pseustes poecilonotus**	1	1	100	
Ophiotaenia sp.	*Tripanurgus compressus**	2	1	50	
Vaucheriella bicheti	*Tropidophis taczanowskyi*	1	1	100	
Paraguay	**44 species**	**124**	**32**	**25.8%**	**8/44 (18%)**
Ophiotaenia sp.	*Erythrolamprus aesculapii**	3	2	66.6	
Ophiotaenia sanbernardinensis	*Helicops leopardinus*	3	3	100	
Ophiotaenia paraguayensis	*Hydrodynastes gigas*	7	6	85.7	
Ophiotaenia sp.	*Liophis jaegeri**	2	2	100	
Ophiotaenia sp. 1	*Liophis poecilogyrus**	6	3	50	
Ophiotaenia sp. 2	*Liophis poecilogyrus**	6	1	16.6	
Ophiotaenia sp.	*Mastigodryas bifossatus**	8	7	87.5	
Ophiotaenia sp.	*Philodryas patagonensis**	10	5	50	
Ophiotaenia gilberti *n. sp.*	*Thamnodynastes pallidus**	10	2	20	

Brazil	**36 species**	**450**	**46**	**10.2%**	**9/36 (23%)**
Ophiotaenia sp.	*Liophis poecilogyrus**	12	1	8.3	
Ophiotaenia sp.	*Erythrolamprus aesculapii**	7	2	28.6	
Ophiotaenia sp.	*Phylodryas patagonensis**	18	1	5.6	
Ophiotaenia sp.	*Bothrops moojeni**	9	1	11.1	
Ophiotaenia sp.	*Helicops modestus**	3	1	33.3	
Ophiotaenia sp.	*Oxyrhopus rhombifer**	1	1	100	
Ophiotaenia sp.	*Xenodon neuwiedi**	20	2	10	
Ophiotaenia joanae	*Xenodon neuwiedi*	20	4	20	
Ophiotaenia sp.	*Liophis miliaris*	16	1	6.3	
Ophiotaenia cf *hyalina*	*Liophis miliaris*	16	5	31.2	
Ophiotaenia jarara	*Bothrops jararaca*	87	11	12.6	
Ophiotaenia azevedoi	*Bothrops jararaca*	87	5	5.7	
Ophiotaenia catzeflis	*Bothrops jararaca*	87	8	9.2	
Ophiotaenia euzeti	*Bothrops jararaca*	87	3	3.4	
Costa Rica	**33 species**	**71**	**17**	**24%**	**12/33 (36%)**
Ophiotaenia sp.	*Urotheca eurozonus**	1	1	100	
Ophiotaenia sp.	*Liophis epinephelus**	1	1	100	
Ophiotaenia sp.	*Leptophis nebulosus**	2	1	50	
Ophiotaenia sp.	*Leptophis depressirostris**	6	1	17	
Ophiotaenia sp.	*Leptodeira annulata**	-	3	-	
Ophiotaenia sp.	*Imantodes cenchoa**	3	2	67	
Ophiotaenia sp.	*Dendrophidion vinitor**	2	1	50	
Ophiotaenia sp.	*Erythrolamprus minus**	2	2	100	
Ophiotaenia sp.	*Coluber mentovarius**	1	1	100	
Ophiotaenia sp.	*Porthridium nasutum**	2 ?	2	100	
Crepidobothrium cf *gerrardii*	*Boa constrictor*	5	1	20	
Ophiotaenia sp.	*Bothrops asper**	2	1	50	

TABLE 2. *Ophiotaenia* species known as parasites of reptilian hosts in the New World. (**In bold**, species possessing an apical organ)

Parasite species	Host species	Locality	% surface ovary/% surface proglottis
Ophiotaenia agkistrodontis (Harwood, 1933)	*Agkistrodon piscivorus*	USA	5.1
Ophiotaenia arandasi (Santos & Rolas, 1973)*	*Liophis miliaris*	Brazil	5.1
Ophiotaenia azevedoi de Chambrier & Vaucher, 1992	*Bothrops jararaca*	Brazil	1.9
Ophiotaenia barbouri Vigueras, 1934	*Tretanorhinus variabilis*	Cuba	2.9
Ophiotaenia calmettei (Barrois, 1898)	*Bothrops lanceolatus*	Martinique	2.2
Ophiotaenia catzeflisi (de Chambrier &Vaucher, 1992)*	*Bothrops jararaca*	Brazil	2.1
Ophiotaenia crotali Lopez-Neyra & Diaz-Ungria, 1958	*Crotalus durissus terrificus*	Venezuela	2.8
Ophiotaenia elongata Fuhrmann, 1927	"small snake"	Brazil	2.5
Ophiotaenia euzeti (de Chambrier & Vaucher, 1992)*	*Bothrops jararaca*	Brazil	2.2
Ophiotaenia faranciae (MacCallum, 1921)	*Farancia abacura*	USA	2.1
Ophiotaenia flava Rudin, 1917	*Coluber* sp.	Brazil	3.6
Ophiotaenia grandis La Rue, 1911	*Agkistrodon piscivorus*	USA	2.1
Ophiotaenia habanensis Freze & Ryšavy, 1976	*Tropidophis pardalis*	Cuba	2.7
Ophiotaenia hyalina Rudin, 1917	*Coluber* sp.	Brazil	5.5
Ophiotaenia jarara Fuhrmann, 1927	*Bothrops jararaca*	Brazil	2.4
Ophiotaenia joanae (de Chambrier & Paulino, 1997)*	*Xenodon neuwiedii*	Brazil	3.1
Ophiotaenia lactea (Leidy, 1855)	*Natrix sipedon*	USA	?
Ophiotaenia macrobothria Rudin, 1917	*Elaps corallinus*	Brazil	4.4
Ophiotaenia marenzelleri (Barrois, 1898)	*Agkistrodon piscivorus*	USA	2.6
Ophiotaenia micruricola (Shoop & Corkum, 1982)*	*Micrurus diastema*	Mexico	3.2
Ophiotaenia nattereri (Parona, 1901)	*Coluber* sp.	Brazil	?
Ophiotaenia paraguayensis Rudin, 1917	*Hydrodynastes gigas*	Paraguay	3.3
Ophiotaenia perspicua La Rue, 1911	*Natrix rhombifer*	USA	2.3
Ophiotaenia racemosa (Rudolphi, 1819)	*Coluber* sp.	Brazil	4.3
Ophiotaenia sanbernardinensis Rudin, 1917	*Helicops leopardinus*	Paraguay	5.0
Ophiotaenia variabilis (Brooks, 1978)*	*Natrix cyclopion*	N. America	2.8
Proteocephalus aggregate:			
Proteocephalus ambiguus (Dujardin, 1845)	*Pungitius pungitius*	Palaearctic	16.7
Proteocephalus cernuae (Gmelin, 1790)	*Gymnocephalus cernuus*	Palaearctic	13
Proteocephalus filicollis (Rudolphi, 1802)	*Gasterosteus aculeatus*	Palaearctic	16.3
Proteocephalus gobiorum Dogiel et Bychowsky, 1939	*Gobius niger*	Palaearctic	19.7
Proteocephalus longicollis (Zeder, 1800)	*Osmerus eperlanus*	Palaearctic	13.3
Proteocephalus macrocephalus (Creplin, 1825)	*Anguilla anguilla*	Palaearctic	18.3
Proteocephalus percae (Müller, 1780)	*Perca fluviatilis*	Palaearctic	13.8
Proteocephalus torulosus (Batsch, 1786)	*Leuciscus cephalus*	Palaearctic	14.6

* New combination

intermediate hosts (Freze, 1965b; Békési *et al.*, 1992; Scholz & de Chambrier, 2003). Therefore, we would expect a higher percentage of infected hosts species for the amphibians, which are more closely linked with water than the reptiles. The life-cycles of *Ophiotaenia* of amphibians and reptiles may include an additional intermediate host (Freeman, 1973), even if the exact role of paratenic hosts in the parasite transmission is not yet elucidated (Scholz & de Chambrier, 2003). The difference in the global percentage may be explained at the level of the paratenic host, but remain hypothetical because no Neotropical life-cycle is known for any *Ophiotaenia* species, and the amount of information on trophic behaviour for each potential definitive host is extremely limited.

We have to stress that most of the listed hosts (Table 1, noted with*) are new hosts for Proteocephalidean cestodes. The *Ophiotaenia* sp. cited in Table 1 are considered as new species, study of which is in progress. As already observed for the *Ophiotaenia* of amphibian hosts (de Chambrier *et al.*, 2006), each snake species (Table 1) harbours a particular species of *Ophiotaenia*. So, these *Ophiotaenia* appear to be oioxenous (*sensu* Euzet & Combes, 1980).

Freze (1963) erected a new family, Ophiotaeniidae and subfamily Ophiotaeniinae for the Proteocephalidea parasites of reptiles and amphibians, but both family and subfamily were rarely used or accepted. Freze (1965a, b) confirmed and justified his decision by the presence of subquadrate or longer than wide mature and gravid proglottides, by the preformed uterus in the first mature proglottis and by the presence of testes scattered in two lateral fields. This opinion was questioned by Brooks (1978), who argued that until a consistent character other than the host is documented, he would consider *Ophiotaenia* as junior synonym of *Proteocephalus*. de Chambrier & Vaucher (1984), described a Proteocephalidea, *Proteocephalus gaspari*, possessing a preformed uterus with two lateral testes fields but from a fish host, and attributed this worm to the genus *Proteocephalus*. It is now known that both *Proteocephalus* and *Ophiotaenia* are polyphyletic, or at least paraphyletic (Zehnder & Mariaux, 1999; Scholz & de Chambrier, 2003; de Chambrier *et al.*, 2004, Hypša *et al.*, 2005), but no *Ophiotaenia* parasitic in amphibians and only three from Neotropical snakes were analysed (de Chambrier *et al.*, 2004). So, waiting for a better understanding of the systematics of the group, we consider that the presence of two separate testes fields linked with preformed uterus are good discriminant characters to isolate *Ophiotaenia* from *Proteocephalus*.

Furthermore, we observed that, in all *Ophiotaenia* with two separate testes fields parasites of New World snakes, the ovary is small, occupying a surface notably smaller (in relation to the proglottis surface) than in most *Proteocephalus* parasites of Palaearctic fishes (Table 2). In 25 of 27 *Ophiotaenia* observed, the ratio ovary surface/proglottis surface is 1.9-5.5% (x = 3.2%) and in 8 members of *Proteocephalus* aggregate (*sensu* de Chambrier *et al.*, 2004), the ratio ovary surface/proglottis surface is 13-19.7% (x = 15.7%) (Table 2). This new character needs to be studied in both genera from other geographical areas and may become important in Proteocephalidea systematics.

Seven *Proteocephalus* species parasites of snakes have two separate testicular fields and a small ovary surface/proglottis surface ratio. Consequently, we transfer the following species to *Ophiotaenia*: *Proteocephalus arandasi* Santos & Rolas, 1973 becomes *Ophiotaenia arandasi* new combination; *P. azevedoi* de Chambrier. & Vaucher, 1992 becomes *O. azevedoi* new combination; *P catzeflisi* de Chambrier & Vaucher, 1992 becomes *O. catzeflisi* new combination; *P. euzeti* de Chambrier & Vaucher, 1992 becomes *O. euzeti* new combination; *P. joanae* de Chambrier & Paulino, 1997 becomes *O. joanae* new combination; *P. micruricola* (Shoop & Corkum, 1982) becomes *O. micruricola* new combination; *P. variabilis* Brooks, 1978 becomes *O. variabilis* new combination.

ACKNOWLEDGEMENTS

The authors are indebted to the members of the Geneva Natural History Museum expedition in Paraguay, who collected the material, Jean Mariaux for fruitful suggestions, Tomáš Scholz for helpful discussions and Andreas Schmitz, who made the identification of the host. We are grateful to Florence Marteau and Gilles Roth (Geneva) for their help with drawings. We thank Hernando Bertoni, Ministro de Agricultura y Ganaderia, (Asuncion) for the authorizations of the host collection. This study was supported in part by the National Science Foundation PBI award Nos. 0818696 and 0818823.

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